What is claimed is:

1. In a radio communication system having a first communication station and a second communication station between which data is communicated, data communication by the second communication station to the first communication station effectuated upon a first channel and data communication by the first communication station to the second communication station effectuated upon a second channel, the first communication station having an antenna array capable of forming an adaptively-selectable antenna pattern configuration, an improvement of apparatus for selecting the antenna pattern configuration formed by the antenna array responsive to indications of data communicated by the second communication station to the first communication station, said apparatus comprising:

a reformulator coupled to receive the indications of the data communicated by the second communication station to the first communication station, said reformulator for reformulating the indications into a vector representation of the indications, the vector representation including a coefficient vector;

a coefficient-vector calculator operable responsive to formation of the vector representation by said reformulator, said coefficient-vector calculator for calculating values of the coefficient vector forming a portion of the vector representation formed by said reformulator;

a second-channel, channel characteristic calculator coupled to receive indications of the values of the coefficient vector formed by said coefficient-vector calculator, said second-channel channel characteristic calculator for calculating indications of characteristics of the second channel, the indications of the characteristics of the second channel used to select the antenna pattern configuration.

2. The apparatus of claim 1 wherein the radio communication system comprises a frequency division duplex (FDD) system, wherein the first channel is defined about a first frequency and the second channel is defined about a second frequency, and wherein the indications of the data responsive to which said reformulator forms the vector representation comprises indications of channel characteristics of the first channel.

3. The apparatus of claim 2 wherein the indications of the channel characteristics to which said reformulator is coupled to receive comprise a first-channel, channel correlation matrix.

4. The apparatus of claim 3 further comprising a channel correlation matrix generator coupled to receive the indications of the data, said channel correlation matrix generator for generating the first-channel, channel correlation matrix, said reformulator coupled to said first-channel, channel correlation matrix generator to receive the first-channel, channel correlation matrix generated thereat.

5. The apparatus of claim 3 wherein said reformulator reformulates the first-channel, channel correlation matrix into a single-column matrix, the single-column matrix forming the coefficient vector.

6. The apparatus of claim 1 wherein said coefficient vector calculator calculates optimal values, according to a selected optimization scheme, of the coefficient vector.

7. The apparatus of claim 6 wherein the optimization scheme comprises a minimization scheme.

8.The apparatus of claim 3 wherein the indications of the characteristics of the second channel formed by said second-channel, channel characteristic calculator comprise a second-channel correlation matrix.

9. The apparatus of claim 8 further comprising an antenna pattern configuration selector coupled to said second-channel, channel characteristic calculator, said antenna configuration selector for selecting, responsive to the indications of the characteristics of the second channel calculated by said second-channel characteristic calculator, the antenna pattern.

10. The apparatus of claim 9 wherein the antenna array comprises a plurality of antenna devices, each antenna device having a selectable weighting associated therewith and wherein said antenna pattern configuration selector selects weightings associated with the antenna devices.

11. In a method for communicating in a communication system having a first communication station and a second communication station between which data is communicated, data communication by the second communication station to the first communication station effectuated upon a first channel and data communication by the first communication channel to the second communication station effectuated upon a second channel, the first communication station having an antenna array capable of forming an adaptively-selectable antenna pattern configuration, an improvement of a method for selecting the antenna pattern configuration formed by the antenna array responsive to indications of data communicated by the second communication station to the first communicated, said method comprising:

reformulating the indications of the data communicated by the second communication station to the first communication station into a vector representation of the indications, the vector representation including a coefficient vector;

calculating values of the coefficient vector of the vector representation formed during said operation of reformulating;

calculating indications of characteristics of the second channel responsive to the values of the coefficient vector, the indications of the characteristics of the second channel used to select the antenna pattern configuration.

12. In a radio communication system having a first communication station and a second communication station between which data is communicated, data communication by the second communication station to the first communication station effectuated upon a first channel and data communication by the first communication station to the second communication station effectuated upon a second channel, the first communication station having an antenna array capable of forming an adaptively-selectable antenna pattern configuration, an improvement of apparatus for selecting the antenna pattern configuration formed by the antenna array responsive to indications of data communicated by the second communication station to the first communication station, said apparatus comprising:

Balaji's Comment: I think this and subsequent claims and the associated figure have to be redone. There is no "angle determining" step in the actual algorithm. I have explained using some "angles of arrival" in order to convey how it works. The steps involved are simply: obtain channel correlation matrix, discrete fourier transform, interpolate, inverse discrete fourier transform, estimate antenna weights.

an angle determiner coupled to receive indications of the data communicated by the second communication station to the first communication station, said angle determiner for determining first channel communication angles of the data communicated by the second communication station to the first communication station;

an associator coupled to receive indications of the first-channel communication angles determined by said angle determiner, said associator for associating corresponding second-channel communication angles responsive to the first-channel communication angles; and

a transformer for transforming values representative of the second-channel communication angles formed by said associator, transforms formed by said transformer defining indications of characteristics of the second channel, the indications of characteristics of the second channel used to select the antenna pattern configuration.

13. The apparatus of claim 12 wherein the indications of the data to which said angle determiner is coupled to receive comprise indications of a correlation matrix of data communicated by the second communication station to the first communication station.

14. The apparatus of claim 12 wherein the radio communication system comprises a frequency division duplex system, wherein the first channel is defined about a first frequency and the second channel is defined about a second frequency, and wherein the corresponding second-channel communication angles formed by said associator are multiplicative products of the first-channel communication angles and a multiplier factor.

15. The apparatus of claim 14 wherein the multiplier factor comprises a ratio formed of values of the first frequency and the second frequency.

16. The apparatus of claim 15 further comprising an interpolator coupled to receive indications of the second-channel communication angels formed by said associator, said interpolator for interpolating values of the second-channel communication angles to form equally-spaced values of the second-channel communication angles.

17. The apparatus of claim 16 wherein said transformer is coupled to receive the equally-spaced values and wherein the values representative of the second-channel communication angles transformed by said transformer comprise the equally-spaced values.

18. The apparatus of claim 12 wherein said transformer comprises a discrete Fourier transformer, and the transforms performed by said discrete Fourier transformer comprise discrete Fourier transform values.

19. The apparatus of claim 12 further comprising an antenna pattern configuration selector coupled to said transformer, said antenna pattern configuration selector for selecting, responsive to the transforms formed by said transformer, the antenna pattern.

20. The apparatus of claim 19 wherein the antenna array comprises a plurality of antenna devices, each antenna device having a selectable weighting associated therewith and wherein said antenna pattern configuration selector selects weightings associated with the antenna devices.